IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Application of	PATENT APPLICATION
James J. Finley; Mehran Arbab	
Serial No.: 10/075,021	Group Art Unit: 1775
Filed: February 12, 2002	Examiner: A. T. Piziali
For: DURABLE SPUTTERED METAL OXIDE COATING	Attorney Docket No.: 1074D2

BRIEF ON APPEAL

I. REAL PARTY IN INTEREST

The real party in interest is PPG Industries Ohio, Inc. a corporation of the State of Delaware having a place of business at Cleveland, Ohio. PPG Industries Ohio, Inc is a wholly owned subsidiary of PPG Industries Inc. a corporation of the Commonwealth of Pennsylvania having a place of business at Pittsburgh, Pennsylvania.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents, Alexandria, VA 22313, on
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II. RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences known to appellants, the appellants' legal representatives, or assignees which will directly affect or be directly affected by or have a bearing on the decision of the Board of Appeals and Interferences (hereinafter also referred to as the "Board") in the pending appeal.

III. STATUS OF THE CLAIMS

Claims 21 – 52 are in the application, are rejected, and are on appeal. No claims are indicated allowable.

IV. STATUS OF AMENDMENTS

A Final Office Action in the above application was mailed February 11. 2003. An Amendment Under 37 CFR 1.116 was timely mailed on April 10, 2003, canceling claim 51 and amending claims 38, 40, 50 and 52 to overcome rejections under 35 U.S.C. 112, first paragraph.

The proposed amendment was not entered because according to the Advisory Action mailed April 29, 2003, the amendments to the claims raise new issues that would require further consideration and/or search. The Advisory Action also indicated that for purposes of Appeal the proposed amendment would not be entered.

V. SUMMARY OF INVENTION

Metal oxides are known to be deposited by sputtering the respective metals in an oxidizing atmosphere such as air or a mixture of oxygen and inert gas such as argon. It is also known that a metal film can be deposited by sputtering a metal in an inert atmosphere such as argon, and the metal film subsequently oxidized thermally by heating in an oxidizing atmosphere such as air. (Page 1, Background, lines 4-11 of the specification.)

Generally, sputtering in an inert atmosphere, i.e. in the metallic mode, is faster and more efficient. The resulting coating is a metal film having metallic

properties, i.e. generally low transmittance, high reflectance and electrical conductivity. Such films are generally not very hard or durable, and are easily damaged in handling. Dielectric metal oxide films are typically high transmittance, lower reflectance and electrically insulating. However, because they are insulating, they do not deposit as efficiently by sputtering. To produce very thick metal oxide films by sputtering is inefficient. To produce very thick metal oxide films by thermally oxidizing metal films efficiently sputtered in an inert atmosphere is inherently rate-limited because oxygen may not readily penetrate beyond the initially formed surface layer of metal oxide. (Page 1, Background, line 20 to page 2, line2)

The present invention relates to a coated article having, among other things, a metal film that is amorphous rather than crystalline. The amorphous sputtered metal film is harder and more durable than a metal film sputtered in an atmosphere consisting of only inert gas. The amorphous sputtered metal film may be thermally oxidized more efficiently than a metal film deposited in an atmosphere consisting of only inert gas, resulting in a crystalline metal oxide film which is substantially more chemically durable than an amorphous metal oxide film deposited by sputtering metal in an oxidizing atmosphere. (Page 2, lines 4-16)

Metals preferably titanium and zirconium, may be deposited in a substantially amorphous metallic state in accordance with the present invention by sputtering the metal in a nonreactive atmosphere substantially comprising inert gas, but also comprising a small amount of reactive gas, such as oxygen and/or nitrogen, preferably oxygen. The amount of oxygen is sufficient to effect the deposition of the metal in a substantially amorphous rather than crystalline state, but insufficient to effect the transition of sputtering from the metallic mode to the oxide mode. The appropriate amount of oxygen in the inert gas for purposes of the present invention is related to the cathode operating parameters, particularly the power, and the size of the target. (Page 3, lines 6-18)
Figures 1 and 2 illustrate the maximum oxygen concentration in argon at various levels of power for titanium and zirconium targets respectively

operated in a laboratory scale coater. At higher oxygen concentrations, the sputtering mode will switch from metallic to oxide, resulting in the slow deposition of amorphous metal oxide. Therefore, the oxygen concentration is kept sufficiently low to avoid depositing metal oxide. However, it has been discovered that the higher the oxygen concentration, below the switching point, the harder the amorphous metal deposited in the metal sputtering mode. (Page 3, lines 19-27)

Figure 3 illustrates the voltage as a function of oxygen concentration for titanium films deposited at power levels of from 1 to 4 kilowatts in a laboratory scale coater. The voltage peak for each curve illustrates the switching point between metallic and oxide sputtering modes, and indicates the maximum oxygen concentration for the specified power level using this coating apparatus. It is preferred to operate near the peak, i.e. at a relatively higher concentration of oxygen, for maximum metal hardness, but without switching from the metallic sputtering mode to the oxide sputtering mode. (Page 4, lines 1-10)

The amorphous metal film sputtered in an oxygen-containing but substantially nonreactive atmosphere is only slightly higher in transmission than a metal film sputtered in pure argon; and the sputtering rate is approximately the same. However, the amorphous metal coating sputtered in an oxygen-containing but substantially nonreactive atmosphere is significantly harder and less dense than a crystalline metal film sputtered in pure argon. (Page 4, lines 11-17)

The density of amorphous titanium metal film sputtered in an essentially nonreactive atmosphere comprising inert gas and 10 percent oxygen is 4.0 grams per cubic centimeter (g/cm^3), compared with a density of 4.5 g/cm^3 for a titanium metal film sputtered in pure argon. The lower density of the amorphous titanium metal film enhances its rate of oxidation, so that the amorphous titanium metal film may be thoroughly oxidized at lower

temperatures and/or in shorter times than required for oxidation of crystalline titanium metal film. (Page 4, line 26 to page 5, line 5)

The hard, dense, amorphous metal coating of the present invention, is sufficiently durable to withstand handling, shipping and processing, such as heat strengthening, tempering and bending. It is preferred to further process the amorphous metal film of the present invention by thermally oxidizing the metal to metal oxide. The hard amorphous metal film of the present invention may be thermally oxidized to metal oxide by heating to produce a haze-free, dense, substantially crystalline metal oxide coating which is sufficiently chemically and physically durable to be coated on the exposed surface of a glass substrate. Heating an amorphous sputtered metal film to produce a crystalline metal oxide film is a more efficient method to produce thick metal oxide films than reactively sputtering such films. Moreover, the crystalline thermally oxidized metal oxide films are more chemically durable than the substantially amorphous reactively sputtered metal oxide films. Such crystalline thermally oxidized metal oxide films may be produced over a wide range of thicknesses having a wide range of desirable reflected colors produced by interference effects. (Page 5, lines 6-29)

The density of the crystalline thermally oxidized titanium coating is greater than the density of amorphous reactively sputtered titanium dioxide coating; the crystalline thermally oxidized titanium oxide coating has a density of 4.0 grams per cubic centimeter (g/cm^3) while the amorphous sputtered titanium oxide has a density of 3.4 g/cm^3. The density of crystalline thermally oxidized titanium oxide coatings approaches the bulk density of 4.26 g/cm^3 for the rutile phase of TiO_2. (Page 6, lines 1-12)

The refractive index at 600 nanometers of an amorphous reactively sputtered titanium oxide film is 2.3, whereas the refractive index at 600 nanometers of a crystalline titanium oxide film thermally oxidized from an amorphous titanium metal film sputtered in an essentially nonreactive atmosphere comprising

argon and 10 percent oxygen is 2.5, which is nearly the refractive index of the rutile phase of bulk crystalline TiO_2. (Page 6, lines 13-19)

The coated article of the present invention includes, among other things, a metal oxide film over the amorphous metal film and optionally heating the coated article to produce a single homogenous layer of titanium oxide. (Page 10, Example 5)

VI. ISSUES

Issue (a) Whether claims 38 – 42 are unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Issue (b) Whether claim 40 is unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Issue (c) Whether claims 50 and 52 are unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Issue (d) Whether claim 51 is unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Issue (e) Whether claims 21 – 52 are unpatentable under 35 U.S.C. 102(b) over Depauw et al U.S. Patent No. 5,110,662 (also referred to as "Depauw").

Issue (f) Whether clams 21 – 52 are unpatentable under 35 U.S.C. 103(a) over U.S. Patent No. 5,110,662 to Khanna et al (also referred to as "Khanna") in view of Depauw.

VII. GROUPING OF CLAIMS

Issue (a) Whether claims 38 – 42 are unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Claims 38 – 42 stand or fall together.

Issue (b) Whether claim 40 is unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Claim 40 stands alone

Issue (c) Whether claims 50 and 52 are unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Claims 50 and 52 stand or fall together.

Issue (d) Whether claim 51 is unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Claim 51 stands alone.

Issue (e) Whether claims 21 – 52 are unpatentable under 35 U.S.C. 102(b) over Depauw et al U.S. Patent No. 5,110,662 (also referred to as "Depauw").

Claims 21 and 27 – 36 stand and fall together.

Claims 22 – 24 stand and fall together.

Claim 25 stands alone.

Claim 26 stands alone.

Claim 37 stands alone.

Claims 38, 41 and 42 stand and fall together.

Claim 39 and 46 stand and fall together.

Claim 40 stands alone.

Claim 43 stands alone.

Claim 44 stands alone.

Claim 45 stands alone.

Claims 47, 49 and 50 stand and fall together

Claim 48 stands alone.

Claim 51 stands alone.

Claim 52 stands alone.

Issue (f) Whether clams 21 – 52 are unpatentable under 35 U.S.C. 103(a) over Khanna et al (also referred to as "Khanna") in view of Depauw.

Claims 21 and 27 – 36 stand and fall together.

Claims 22 – 24 stand and fall together.

Claim 25 stands alone.

Claim 26 stands alone.

Claim 37 stands alone.

Claims 38, 41 and 42 stand and fall together.

Claim 39 and 46 stand and fall together.

Claim 40 stands alone.

Claim 43 stands alone.

Claim 44 stands alone.

Claim 45 stands alone.

Claims 47, 49 and 50 stand and fall together

Claim 48 stands alone.

Claim 51 stands alone.

Claim 52 stands alone.

VIII. ARGUMENT

Issue (a) Whether claims 38 – 42 are unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

The Office Action alleges, among other things, that specifically regarding claim 38, the specification does not speak of more than one metal oxide film on the metal film. Claims 39 – 42 are dependent on claim 38 which is dependant on claim 21.

Applicants in the Amendment Under 37 CFR 1.116 which was filed but not entered, amended claim 38 to overcome the rejection of claims 38 – 42 under 35 U.S.C. 112, first paragraph. Applicants respectfully submit that the amendment to claims 38 would have overcome the rejection of claims 38 – 42 under 35 U.S.C. 112, first paragraph.

Issue (b) Whether claim 40 is unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

The Office Action alleges, among other things, that the application is not enabled for a crystalline metal oxide over an amorphous metal film.

Applicants in the Amendment Under 37 CFR 1.116 which was filed but not entered, amended claim 40 to overcome the rejection of claim 40 under 35 U.S.C. 112, first paragraph. Applicants respectfully submit that the amendment to claim 40, would have overcome the rejection of claim 40 under 35 U.S.C. 112, first paragraph.

Issue (c) Whether claims 50 and 52 are unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

The Office Action alleges, among other things, that the specification does not speak of a crystalline metal oxide film over the amorphous metal film.

Claim 52 is dependant on claim 50 which is dependant on claim 47 which is dependent on claim 21. Applicants in the Amendment Under 37 CFR 1.116 which was filed but not entered, amended claims 50 and 52 to overcome the rejection of claims 50 and 52 under 35 U.S.C. 112, first paragraph. Applicants respectfully submit that the amendments to claims 50 and 52 would have overcome the rejection of claims 50 and 52 under 35 U.S.C. 112, first paragraph.

Issue (d) Whether claim 51 is unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Withdraw

The Office Action alleges, among other things, that the specification is enabling for a coated product comprising an underlying layer of amorphous metal and an overlying layer of amorphous metal oxide (page 7, lines 11 – 26) or a coated product comprising an underlying layer of metal oxide (formed by thermal oxidation) and an overlying layer of metal oxide (formed from

sputtering in 50/50 oxygen/argon atmosphere) (page 19, lines 9 – 28), and that the applicants fail to provide enablement for a coated product comprising a crystalline metal oxide film and an overlying layer of metal oxide.

Applicants respectfully traverse this rejection and submit that the specification is to be read together. More particularly, page 7, lines 11 – 17, discloses that a thin layer of reactively sputtered amorphous metal oxide is deposited over the amorphous metal oxide film. On page 10, lines 9 – 28 in a specific non-limiting example of the invention, the reactive atmosphere is a 50/50 oxygen/argon reactive atmosphere. Page 2 lines 4 – 16 of the specification discloses that the amorphous metal film may be thermally oxidized resulting in a crystalline metal oxide film.(lines 11 – 16).

Applicants respectfully submit that the above discussions in the specification read together support independent claim 51 which recite, among other things, a "coated product comprising a crystalline metal oxide and an overlying layer of metal oxide.

Issue (e) Whether claims 21 – 52 are unpatentable under 35 U.S.C. 102(b) over Depauw et al U.S. Patent No. 5,110,662 (also referred to as "Depauw").

FIRST OVERVIEW

Applicants respectfully traverse the rejection of claims 21-52 under 35 U.S.C. 102(b).

The Office Action acknowledges that Depauw does not specifically mention that the initial metal film is amorphous and alleges that Depauw does disclose that the metal may be deposited in a sub-oxide or even metallic state (paragraph bridging columns 4 and 5). The Office Action continues by alleging that the metal film may be deposited in sub-oxide or metallic state while being deposited in an oxygen containing atmosphere and that it appears that the oxygen content is sufficient to effect the deposition in a substantially amorphous rather than crystalline state. The Office Action alleges that absent

a showing of otherwise, it appears that the metal film of Depauw is amorphous in structure.

Applicants respectfully disagree with the unsupported allegations of the Office Action. Depauw in the paragraph bridging columns 4 and 5 states that

> In the sputtering of metal in an oxygen-containing atmosphere the oxide product is not necessarily obtained in the fully oxidized state. At least part of the product may be present as a sub-oxide or even in the metallic state. Subsequent depositions in a reactive atmosphere and any subsequent heat treatment of the coated panel do however tend to complete the oxidation of any residual metal or sub-oxides formed in the earlier deposition.

The above excerpt is the only mention in Depauw that a film in the sub-oxide or metallic state (hereinafter referred to "residual metal") may result from sputtering in a metal cathode in an oxygen-containing atmosphere. The above statement does not discuss how a sub-oxide or "residual metal" is obtained, it does not discuss how the sub-oxide or "residual metal" are fully oxidized, <u>if they are fully oxidized</u> (Depauw discloses that "subsequent depositions in a reactive atmosphere <u>tend</u> to complete the oxidation of any residual metal or sub-oxides formed in the earlier deposition" (underlining added)).

There is no discussion in Depauw of the structure of the residual metal. Is it "crystalline" or "amorphous?" The Office Action alleges that it appears that the oxygen content of Depauw is sufficient to effect the deposition in a substantially amorphous rather than crystalline state. Applicants submit that there is no discussion in Depauw of the content of the atmosphere other than "it is oxygen containing." The oxygen content may be sufficiently low to deposit a crystalline metal film. The Office Action alleges that absent a showing of otherwise, it appears that the metal film of Depauw is amorphous in structure. Applicants respectfully submit that the showing that "Depauw does not disclose applicants' claimed coated product" is the lack of

information provided by Depauw to obtain the "residual metal" film. Applicants in the description of their patentably novel invention disclose that to obtain an amorphous metal film the appreciate amount of oxygen in an inert gas, the cathode operating parameters, particularly the power, and the size of the target have to be considered (Page 3, lines 12 – 18 of the specification). There is no discussion in Depauw of the amount of oxygen in the atmosphere; Depauw mentions an "oxygen-containing atmosphere"; the oxygen content appears to be low enough to deposited sub-oxide films and because the oxygen is low the "residual metal" film is most probably deposited as a crystalline metal film and not as applicants' claimed amorphous metal film. Further there is no discussion in Depauw of the operating power of the cathode or the cathode size needed to obtain an amorphous metal film.

The discussion of Depauw in paragraph bridging columns 4 and 5 is not a teaching because it does not provide sufficient information to obtain the product described by Depauw, e.g. a sub-oxide film or a "residual metal" film. Further there is no teaching on how to fully oxidize the sub-oxide film or the "residual metal" film. Depauw states that "subsequent depositions in a reactive atmosphere tend to complete the oxidation of any residual metal or sub-oxides formed in the earlier deposition." The forgoing statement by Depauw is a teaching that the sub-oxide films or "residual metal" film may not be fully oxidized. Further there are no disclosures in Depauw of when or how to complete the oxidation of the sub-oxide films or "residual metal" film.

A clear reading the paragraph bridging columns 4 and 5 of Depauw is that the sub-oxide film and "residual metal" film are not a desired or controlled result. The discussion is not directed to how the sub-oxide film and "residual metal" film are obtained but that they tend to go away, e.g. the films are completely oxidize in subsequent operations.

The Office Action states that if applicant intends to rely on Examples in the specification or in a submitted declaration to show non-obviousness, the applicant should clearly state how the Examples of the present invention are

commensurate in scope with the claims and how the Comparative Examples are commensurate in scope with Depauw. Further the Office Action states on page 8 that the Patent and Trademark Office can require applicants to prove that prior art products do not necessarily or inherently posses characteristics of claimed products where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes.

Applicants respectfully submit that Depauw does not teach one skilled in the art how to deposit his coating nor how to deposited applicants' amorphous metal film. More particularly, Depauw does not mention the cathode size, the cathode operating power, or the atmosphere that is required to deposit the Depauw "residual metal" film. Further, Depauw does not mention the make-up of the oxygen-containing atmosphere, the cathode power or cathode size used to make the coated articles of the Depauw Examples. Without this basic information, how does one make a coated article of Depauw having the "residual metal" film?

From the forgoing discussion, applicants respectfully submit that Depauw, e.g. the paragraph bridging columns 4 and 5 of the Depauw patent does not provide a teaching to anticipate applicants' claims 21 – 52.

Claims 21 and 27 – 36 stand and fall together.

Claim 21 recites a coated product having, among other things, a substrate; an amorphous metal film over the substrate, and a metal oxide film over the amorphous metal film. Claims 27 – 36 are either directly or indirectly dependent on claim 21.

The discussion of the FIRST OVERVIEW is incorporated herein by reference.

Applicants respectfully submit that Depauw does not anticipate applicants' claim 21. More particularly, Depauw does not disclose an amorphous metal film; however, for the sake of discussion only and not making any admissions

thereto, consider that there is a random occurrence of the "residual metal" film. Since it is a random accordance (Depauw states that the "residual metal" film may be present) any film discussed in Depauw may or may not have a "residual metal" film. How does one select the metal oxide films of the Examples of Depauw and identify them as an amorphous metal film. Depauw discloses that the subsequent coating may complete the oxidation. In those instances where the subsequent coatings complete the Oxidation the only film of Depauw that can be a sub-oxide or "residual metal" film is the last film deposited; the films below the last film except the silver will be fully oxidized. As can be appreciate, there is no metal oxide film over the last deposited film of the Examples of Depauw. In the forgoing scenario, the discussion in Depauw does not anticipate claim 21 which recites, among other things a metal oxide film over the amorphous metal film.

Consider the situation when the "residual metal" film is oxidized after thermal processing. In this instance the coated product as it exits the coater is an intermediate product, and all the films are oxidized during thermal processing. As before there is no metal oxide over an amorphous metal film.

There is no teaching in Depauw that after sputtering or heat treatment that a random effect is present that would provide for selectively fully oxidizing some of, the but not all of the "residual metal" films, if present, such that the selection provides a metal oxide film over a "residual metal" film and that the "residual metal" film is an amorphous metal film. Since the occurrences are random there would be no anticipation of applicants' patentably novel coated product recited in claim 21.

Claims 22 – 24 stand and fall together.

Claim 22 is dependent on claim 21; claim 23 is dependent on claim 22, and claim 24 is dependent on claim 23. Claim 22 recites among other things that the metal of the metal cathode target is selected from titanium (claims 24 and 25), zirconium (claim 24), tantalum, hafnium, niobium, vanadium and mixtures thereof

The Office Action alleges that Depauw discloses that the metal of the metal or metal oxide films may be titanium (column 8, lines 29 –57)

The discussion in the FIRST OVERVIEW and the discussion patentably distinguishing claim 21 over Depauw are hereby incorporated by reference.

Applicants respectfully submit that there is no teaching in Column 8, lines 29 – 57 of Depauw of applicants' patentably novel invention recited in claims 22 – 24. Claim 22 recites, among' other things the metal of the metal target that is used to deposit the amorphous metal film. Depauw in column 8, lines 29 – 57 does not identify the "residual metal" film or the metal of the metal target to deposit the "residual metal" film. The only film of the example in column 8, lines 29 – 57 of Depauw of interest in this discussion is the titanium dioxide film; however, there is no discussion that the titanium dioxide films are the "residual metal" films or that the targets are titanium metal cathode targets.

Claim 25 stands alone.

Claim 25 is dependent on claim 21 and recites, among other things, that amorphous metal film has a thickness ranging from 100A to 1500 A.

The Office Action alleges that Depauw in column 8, lines 29 – 57 discloses that the metal sub-oxide or metallic films may be deposited in the range of 25 to 450 A.

The discussion in the FIRST OVERVIEW and the discussion patentably distinguishing claim 21 over Depauw are hereby incorporated by reference.

Applicants respectfully submit that there is no teaching in Column 8, lines 29 – 57 of Depauw of applicants' patentably novel invention recited in claim 25. More particularly, Depauw does not disclose an amorphous metal film. Assuming for the sake of discussion only and not making any admissions thereto, that there is a random occurrence of the "residual metal" film. Since it is a random accordance (Depauw states that the "residual metal" film may be present) any film discussed in Depauw may or may not have a "residual

metal" film. How does one select the metal oxide films of the Examples of Depauw and identify them as an amorphous metal film. Depauw discloses that the subsequent coating may complete the oxidation. In those instances where the subsequent coatings complete the Oxidation the only film of Depauw that can be a sub-oxide or "residual metal" film is the last film deposited; the films below the last film except the silver will be fully oxidized.

Consider the situation when the "residual metal" film is oxidized after thermal processing. In this instance the coated product as it exits the coater is an intermediate product and all the films are oxidized during thermal processing.

There is no teaching in Depauw that after sputtering or heat treatment that a random effect is present that would provide for selectively fully oxidizing some of, the but not all of the "residual metal" films, if present, such that the selection provides a metal oxide film over a "residual metal" film and that the "residual metal" film is an amorphous metal film. Since the occurrences are random there would be no anticipation of applicants' patentably novel coated product recited in claim 25 because the coating recited in column 8, lines 29 – 57 have film thicknesses below 100A and these films may be the "residual metal" film.

Claim 26 stands alone.

Claim 26 is dependent on claim 25 and recites, among other things, that the metal film has a thickness ranging from 200A to 700 A.

The Office Action alleges that Depauw in column 8, lines 29 – 57 discloses that the metal sub-oxide or metallic films may be deposited in the range of 25 to 450 A.

The discussion in the FIRST OVERVIEW and the discussion patentably distinguishing claims 21 and 25 over Depauw are hereby incorporated by reference.

Applicants respectfully submit that Depauw does not anticipate applicants' claim 25. More particularly, Depauw does not disclose an amorphous metal film. Assuming for the discussion only and not making any admissions thereto, that there is a random occurrence of the "residual metal" film. Since it is a random accordance (Depauw states that the "residual metal" film may be present) any film discussed in the Example of Depauw in column 8, lines 29 – 57 may or may not have a "residual metal" film. How does one select the metal oxide films of the Example of Depauw and identify them or it as an amorphous metal film. Depauw discloses that the subsequent coating may complete the oxidation. In those instances where the subsequent coatings complete the Oxidation the only film of Depauw that can be a sub-oxide or "residual metal" film is the last film deposited; the films below the last film except the silver will be fully oxidized. As can be appreciate, there is no metal oxide film over the last deposited film of the Exampled of Depauw. In the forgoing scenario, the last film would be considered the "residual metal" film and it has a thickness of 100 A which is outside the range recited in claim 26.

Consider the situation when the "residual metal" film is oxidized after thermal processing. In this instance the coated product as it exits the coater is an intermediate product and all the films are oxidized during thermal processing. In this case any of the films can be the "residual metal" film. In this case the only film that is within the range recited in claim 26 is the tin oxide film. Since the event of the tin oxide film being the "residual metal" film has no support for it being the "residual metal" film, Depauw cannot anticipate applicants' coated product recited in claim 26.

Claim 37 stands alone

Claim 37 is dependant on claim 36 which is dependant on claim 21, and recites that the metal film is heated to at least 400^{O}C to change the amorphous metal film to a metal oxide.

The Office Action alleges that Depauw discloses in column 5, lines 21 – 35 that the metal film ("residual metal" film) may be thermally oxidized.

The discussion in the FIRST OVERVIEW and the discussion patentably distinguishing claim 21 over Depauw is hereby incorporated by reference.

Applicants respectfully submit that the discussion of Depauw in column 5, lines 21 – 35 does not disclose that the "residual metal" film may be thermally oxidized. Depauw discloses that

> In the case of the sacrificial metal, which serves the purpose of protecting the silver layer against oxidation, this is converted to oxide during any subsequent exposure to an oxidising atmosphere. This is usually mostly effected during subsequent deposition of metal oxide, but also occurs during any subsequent heat treatment or during prolonged storage. If the silver is not so protected, the coated substrate of glazing material loses its low emissivity and its light transmission is dramatically reduced. The preferred sacrificial metal is titanium, which has the advantages of being easily oxidised and of forming an oxide of very low absorbency. We have discovered that the use of titanium as sacrificial metal gives a very effective barrier against oxidation of the silver.

Assuming for the sake of discussion only, the above discussion in Depauw is relevant to claim 37. The above discussion discloses a metal oxide that does not have the properties of the oxidized amorphous metal film recited in applicants' claim 37. More particularly, the oxidized amorphous metal film has a different density than the oxidized metal film (see discussion on page 6, lines 1 – 12 of the specification). Another difference between the discussion of Depauw and applicants' claim 37 is the fact that claim 37 recites a temperature whereas the above discussion of Depauw does not recite a temperature.

<u>Claim 38, 41 and 42 stand and fall together.</u>

Claim 38 is dependant on claim 36 which is dependant on claim 21. Claim 41 is dependant on claim 38, and claim 42 is dependant on claim 41. Claim 38

recites, among other things, a product having the metal oxide film deposited on the metal film prior to thermal oxidation of the metal film.

The Office Action does not specifically identify passages of Depauw that anticipate claim 38. Regarding claims 41 and 42 the Office Action alleges that Depauw discloses that the metal of the metal or metal oxide films may be titanium (column 8, lines 29 – 57 of Depauw).

The discussion in the FIRST OVERVIEW and the discussion patentably distinguishing claims 21 and 36 over Depauw are hereby incorporated by reference.

The coated product of claim 38 is a metal oxide film over the amorphous metal film. As was discussed above regarding claim 21, there is no discussion in Depauw of a metal film over an amorphous metal film. Support for applicants' position is the fact that there is no disclosure in Depauw of how a sub-oxide or "residual metal" film is obtained. Therefore, the films of the coated articles of Depauw that are sub-oxide or "residual metal" films, if any, can not be identified to determine if the disclosure of Depauw anticipates claims 38, 41 and 42.

Claims 39 and 46 stand and fall together.

Claim 39 is dependent on claim 38, which is dependent on claim 36, which is dependant on claim 21, and claim 46 is dependant on claim 21 and each recite, among other things, that the metal oxide film has a thickness ranging from 40A to 120 A.

The Office Action alleges that Depauw in column 8, lines 29 – 57 discloses that the metal sub-oxide or metallic films may be deposited in the range of 25 to 450 A.

The discussion in the FIRST OVERVIEW and the discussion patentably distinguishing claims 21and 38 over Depauw are hereby incorporated by reference.

The only film of the coated product of Depauw discussed in column 8, lines 29 – 57 is the 100 A titanium dioxide film. Depauw does not disclose that any of the underlying films of the coating article in column 8 are "residual metal" films. The discussion in the paragraph bridging columns 4 and 5 that the films may be sub-oxide or "residual metal' film does not mean that any of the film of the coated article of column 8 are sub-oxide or "residual metal " films.

Since the 100 A titanium dioxide film is not taught as being over an amorphous metal film, the coated article in column 8 of Depauw cannot anticipate applicants' claims 39 and 46.

Claim 40 stands alone.

Claim 40 is dependant on claim 38, which is dependant on 36, which is dependant on claim 21. Claim 40 recites a coated product having, among other things, that the metal in each film is titanium, the density of the metal oxide film deposited over the metal film is 4 grams per cubic centimeter and the refractive index of the metal oxide film is 2.5.

The Office Action alleges that Depauw in column 8, lines 29 – 57 discloses that the metal of the metal or metal oxide may titanium

The discussion in the FIRST OVERVIEW and the discussion patentably distinguishing claims 21and 38 over Depauw are hereby incorporated by reference.

There is no discussion in Depauw of the density or refractive index of the metal oxide films of his coatings. Further there is no discussion in Depauw that the coated article of column 8 of Depauw is thermally oxidized. Applicants on page 6, lines 1 – 12 discusses that the density of crystalline thermally oxidized titanium oxide coating is 4.0 grams per cubic centimeter. Since the article of column 8 of Depauw is not thermally oxidized it cannot anticipate applicants' claim 40.

Claim 43 stands alone.

Independent claim 43 recites a coated article having, among other things, a glass substrate, a first titanium oxide film formed by thermally oxidizing an amorphous sputtered titanium metal film deposited from a titanium metal cathode target in an atmosphere comprising argon and oxygen below a reactive switch point of the titanium metal cathode target, and a second titanium oxide film deposited over the first titanium oxide film. The product has

The Office Action alleges that Depauw in column 8, lines 29 – 57 discloses that the metal of the metal or metal oxide may titanium, the reactive gas may be oxygen (column2, lines 56 – 63), may be argon (column 2, lines 56 – 63), and the substrate may be glass (column 1, lines 16 –27).

The discussion in the FIRST OVERVIEW is hereby incorporated by reference.

Applicants respectfully submit that Depauw does not anticipate applicants' claim 43. More particularly, Depauw does not disclose that the coated article in column 8 of Depauw is thermally oxidized. Applicants on pages 6 and 7 discuss the different properties of sputtered coated thermally oxidized and not thermally oxidized. Since there is a difference in optical properties and density, the thermally treated coated article of claim 43 will be different from the properties of the coated article of column 8 of Depauw that is not thermally oxidized.

Applicants respectfully submit, based on the forgoing, that Depauw does not anticipate applicants' claim 43

Claim 44 stands alone.

Claim 44 is dependent on claim 21 and recites, among other things; that the metal oxide film is comprised of the same metal as the underlying amorphous metal layer.

The Office action alleges that Depauw disclose that the metal of the metal or metal oxide films may be titanium, (column 8, lines 29 – 57).

The discussion in the FIRST OVERVIEW and the discussion patentably distinguishing claim 21 over Depauw is hereby incorporated by reference.

Depauw does not discuss how to make a sub-oxide film or a "residual metal" film. There are no teachings in Depauw that would lead one skilled in the art to identify any of the films in the coated article of column 8 of Depauw as being sub-oxide or "residual metal" films. The titanium films are the only films having the same metal. Based on the discussion in Depauw in the paragraph bridging columns 4 and 5, the top and bottom titanium dioxide films may each be a sub-oxide film or a "residual metal" film, neither may be, or the top only may be or the bottom only may be. Applicants respectfully submit because of the uncertainty of the presence or absence of a sub-oxide film or a "residual metal" film, Depauw cannot anticipate applicants' claim 44.

Claim 45 stands alone.

Claim 45 is dependent on claim 21 and recites that the oxidized amphioxus metal oxide film has increased stability over the amorphous metal film.

The discussion in the FIRST OVERVIEW and the discussion patentably distinguishing claim 21 over Depauw is hereby incorporated by reference.

The Office Action does not reference any discussion in Depauw relating to a coated product that has a reactively sputtered amorphous metal oxide film over the amorphous metal film. Since there is no referenced discussion in Depauw, applicants respectfully submit that Depauw does not anticipate applicants' claim 46.

Claim 47, 49 and 50 stand and fall together.

Claim 47 is dependent on claim 21; claims 49 and 50 is dependant on claim 47. Claim 47 recites a coated product having, among other things anamorphous metal layer harder and less dense than a crystalline metal film sputtered in pure argon. The lower density enhances the rate of oxidation so that the amorphous metal film may be thoroughly oxidized at lower

temperatures or in shorter times than required for oxidation of crystalline metal film.

The discussion in the FIRST OVERVIEW and the discussion patentably distinguishing claim 21 over Depauw is hereby incorporated by reference.

The Office Action does not reference any discussion in Depauw relating to a coated product that has, among other things, an amorphous metal layer that is harder and less dense than a crystalline metal film of the type sputtered in pure argon. The lower density enhances the rate of oxidation so that the amorphous metal film may be thoroughly oxidized at lower temperatures or in shorter times than required for oxidation of crystalline metal film. Since there is no referenced discussion in Depauw, applicants respectfully submit that Depauw does not anticipate the article of applicants' claim 46.

Claim 48 stands alone.

Independent claim 48 recites, among other things a coated product having, among other things, a substrate and a metal oxide film from oxidation of an essentially amorphous metal film sputtered from a metal cathode target in an atmosphere comprising inert gas and reactive gas, the metal in the metal cathode target having a reactive gas switch point, wherein the concentration of the reactive gas during sputtering is below the reactive gas switch point such that the metal target is sputtered in a metallic mode to deposit a metal film having an amorphous structure.

The Office Action alleges that Depauw in column 5, lines 21 – 35 discloses that the metal film may be thermally oxidized.

The discussion in the FIRST OVERVIEW and the discussion patentably distinguishing claim 21 over Depauw are hereby incorporated by reference.

The metal oxide from the oxidized amorphous metal film is more chemically durable than an amorphous metal oxide film deposited by sputtering metal in an oxidizing atmosphere. The product of claim 48 is distinguishable from the

product made according to the disclosure in column 5, lines 21 – 35 of Depauw. More particular the film of claim 48 would be more chemically durable because it is an oxidized amorphous metal film whereas the films of Depauw would be less chemically durable because it is a film that is partially or totally oxidized during the sputtering of the oxide films of the overcoat (see column 8, lines 50 – 64 of Depauw.

Since the oxidized films of the coated product of claim 48 is different from the oxidized film in column 5, lines 21 – 35 of Depauw, Depauw does not anticipate applicants' claim 48.

Claim 51 stands alone.

Independent claim 51 recites a coated product having, among other things, a substrate; and a metal oxide film comprised of crystalline metal oxide from oxidation of an essentially amorphous metal film sputtered from a metal cathode target in an atmosphere comprising inert gas and reactive gas, the metal in the metal cathode target having a reactive gas switch point, wherein the concentration of the reactive gas during sputtering is below the reactive gas switch point such that the metal target is sputtered in a metallic mode to deposit a metal film having an amorphous structure. A metal oxide film over the crystalline metal oxide film, where the metal oxide film is deposited by reactive sputtering of amorphous metal oxide over the amorphous metal film.

The Office Action alleges that Depauw discloses that the metal film may be thermally oxidized (column 8, lines 21 – 35).

The discussion in the FIRST OVERVIEW and the discussion patentably distinguishing claim 21 over Depauw are hereby incorporated by reference.

The density of the titanium film in column 5 of Depauw is higher than the density of the crystalline metal oxide film of claim 51. Although there is no metal film identified in claim 51, a comparison of claim 51 to the oxidized film of column 5 of Depauw should be equated, i.e. compare titanium metal oxide films. From the discussion on page 6, lines 1 – 12 of the specification, the

titanium crystalline metal oxide film has a lower density than the titanium oxide film of column 5.

Because the films of claim 51 and of Depauw are different, Depauw does not anticipate the subject matter of claim 51.

Claim 52 stands alone.

Claim 52 is dependent on claim 51 and recites, among other things, a coated product where the crystallized metal oxide film is titanium oxide film with a crystalline structure having a density greater than 3.4 g/cm^3.

The discussion in the FIRST OVERVIEW and the discussion patentably distinguishing claims 21 and 51 over Depauw are hereby incorporated by reference

The Office Action has not identified any section in Depauw that anticipates claim 52. As discussed above regarding claim 51, there is coated article disclosed in Depauw of a crystalline metal oxide as defined in claim 52 having a density a density greater than 3.4 g/cm^3.

Issue (f) Whether clams 21 – 52 are unpatentable under 35 U.S.C. 103(a) over Khanna et al (also referred to as "Khanna") in view of Depauw.

SECOND OVERVIEW

Applicants note that the Office Action makes rejections of certain claims under 35 U.S.C. 103(a) but fails to show combinations of Khanna and Depauw to support such rejections . Applicants will respond to the rejections accordingly.

The discussion of the FIRST OVERVIEW is hereby incorporated by reference.

Applicants respectfully submit that an artisan skilled in the art of depositing corrosion resistant coatings would not combine Khanna and Depauw, and an artisan skilled in the art of depositing low emissivtiy transparent coatings

would not combine Depauw and Khanna. Further, the Office Action has failed to show any motivation to combine Khanna and Depauw. The recognition of the value of an amorphous metal film is not discussed in Khanna or in Depauw such that one skilled in the art would be motivated to combine them.

Depauw in the paragraph bridging columns 4 and 5 mentions that a film in the sub-oxide or metallic state (hereinafter referred to residual metal") may result from sputtering in a metal cathode in an oxygen-containing atmosphere. The above statement does not discuss how a sub-oxide or residual metal is obtained, it does not discuss how the sub-oxide or residual metal are fully oxidized, if they are fully oxidized (Depauw discloses that "subsequent depositions in a reactive atmosphere tend to complete the oxidation of any residual metal or sub-oxides formed in the earlier deposition" (underlining added)).

One skilled in the art reading Depauw who teaches away from sub-oxide and "residual metal" films would not be interest in the coating of Khanna. Further the Office Action has failed to identify any teachings in Khanna and/or Depauw or motivation that would lead one skilled in the coating corrosion art and/or transparent low e coating art to combining them.

Applicants respectfully submit that the combination is made based on the benefits of amorphous metal films identified by applicants in their specification. A combination using hindsight is not proper and is not acceptable.

Applicants in the discussions under the section titled "Whether claims 21 – 52 are unpatentable under 35 U.S.C. 102(b) over Depauw et al U.S. Patent No. 5,110,662 (also referred to as "Depauw")" identified defects in Depauw that supported applicants position that Depauw does not anticipate the subject matter of claims 21 – 52. Khanna does not cure the defects and therefore the combination of Khanna and Depauw do not render the subject matter of claims 21 – 52 obvious.

Claims 21 and 27 – 36 stand and fall together.

Claim 21 recites a coated product having, among other things, a substrate; an amorphous metal film over the substrate, and a metal oxide film over the amorphous metal film. Claims 27 – 36 are either directly or indirectly dependent on claim 21.

The discussion of the FIRST and SECOND OVERVIEW is incorporated herein by reference.

Applicants respectfully submit that an artisan would not combine Khanna and Depauw; however for the sake of discussion only and not making any admissions that a combination would be the resultant coated article would render the subject matter of claim 21 obvious. More particularly, Khanna discusses a corrosion resistant coating which would be the outer film for maximum corrosion protection. Combining Khanna with Depauw the film of Khanna would replace the further or outer titanium dioxide layer. With this arrangement, the coated article would **not** have a metal oxide layer over the corrosion layer of Khanna.

Applicants claim 21 recites, among other things, a metal oxide layer over an amorphous metal film. It can now be appreciated that the combination of Khanna and Depauw without the benefit of applicants' disclosure does not render claim 21 obvious.

Claims 22 – 24 stand and fall together.

Claim 22 is dependent on claim 21; claim 23 is dependent on claim 22, and claim 24 is dependent on claim 23. Claim 22 recites, among other things, that the metal of the metal cathode target is selected from titanium (claims 24 and 25), zirconium (claim 24), tantalum, hafnium, niobium, vanadium and mixtures thereof

The Office Action alleges that Khanna discloses that the metal may be titanium (column 1, lines 53 – 63)

The discussion in the FIRST and SECOND OVERVIEW and the discussion patentably distinguishing claim 21 over Khanna in view of Depauw are hereby incorporated by reference.

Applicants respectfully submit that there is no teaching in Column 1, lines 53 – 63 of Khanna of applicants' patentably novel invention recited in claims 22 – 24. Claim 22 recites, among other things, the metal of the metal target that is used to deposit the amorphous metal film. Khanna in column 1, lines 53 – 63 discloses that the amorphous metal is an alloy and not a metal as recited in applicants claim 22.

Claim 25 stands alone.

Claim 25 is dependent on claim 21 and recites, among other things, that amorphous metal film has a thickness ranging from 100A to 1500 A.

The Office Action alleges that Depauw in column 8, lines 29 – 57 discloses that the metal sub-oxide or metallic films may be deposited in the range of 25 to 450 A.

The discussion in the FIRST and SECOND OVERVIEW and the discussion patentably distinguishing claim 21 over Khanna in view of Depauw are hereby incorporated by reference.

Applicants respectfully submit that there is no teaching in Column 8, lines 29 – 57 of Depauw of applicants' patentably novel invention recited in claim 25. More particularly, Depauw does not disclose an amorphous metal film. Assuming for the sake of discussion only and not making any admissions thereto, that there is a random occurrence of the "residual metal" film. Since it is a random occurrence (Depauw states that the "residual metal" film may be present) any film discussed in Depauw may or may not have a "residual metal" film. How does one select the metal oxide films of the Examples of Depauw and identify them as an amorphous metal film. Depauw discloses that the subsequent coating may complete the oxidation. In those instances where the subsequent coatings complete the oxidation, the only film of

Depauw that can be a sub-oxide or "residual metal" film is the last film deposited; the films below the last film except the silver will be fully oxidized.

Consider the situation when the "residual metal" film is oxidized after thermal processing. In this instance the coated product as it exits the coater is an intermediate product and all the films are oxidized.

There is no teaching in Depauw that after sputtering or heat treatment that a random effect is present that would provide for selectively fully oxidizing some of, the but not all of the "residual metal" films, if present, such that the selection provides a metal oxide film over a "residual metal" film and that the "residual metal" film is an amorphous metal film. Since the occurrences are random there would be no teaching of applicants' patentably novel coated product recited in claim 25 because the films recited in column 8, lines 29 – 57 of Depauw, alone or in combination with Khanna, have a thickness below 100A and these films may be the films having the "residual metal" film.

Claim 26 stands alone.

Claim 26 is dependent on claim 25 and recites, among other things, that the metal film has a thickness ranging from 200 A to 700 A.

The Office Action alleges that Depauw in column 8, lines 29 – 57 discloses that the metal sub-oxide or metallic films may be deposited in the range of 25 to 450 A.

The discussion in the FIRST and SECOND OVERVIEW and the discussion patentably distinguishing claims 21 and 25 over Khanna in view of Depauw are hereby incorporated by reference.

Applicants respectfully submit that Depauw does not anticipate applicants' claim 25. More particularly, Depauw does not disclose an amorphous metal film. Assuming for the discussion only and not making any admissions thereto, that there is a random occurrence of the "residual metal" film. Since it

is a random accordance (Depauw states that the "residual metal" film may be present) any film discussed in the Example of Depauw in column 8, lines 29 – 57 may or may not have a "residual metal" film. How does one select the metal oxide films of the Example of Depauw and identify them or it as an amorphous metal film and use the film of Khanna. Depauw discloses that the subsequent coating may complete the oxidation. In those instances where the subsequent coatings complete the oxidation the only film of Depauw that can be a sub-oxide or "residual metal" film is the last film deposited; the films below the last film except the silver will be fully oxidized. As can be appreciate, there is no metal oxide film over the last deposited film of the Examples of Depauw or the film of Khanna used as the last film of Depauw. In the forgoing scenario, the last film would be considered the "residual metal" film and it has a thickness of 100 A which is outside the range recited in claim 26.

Consider the situation when the "residual metal" film is oxidized after thermal processing. In this instance the coated product as it exits the coater is an intermediate product and any of the films can be the "residual metal" film. In this case the only film that is within the range recited in claim 26 is the tin oxide film. Since the event of the tin oxide film being the "residual metal" film has no support for it happening, Depauw cannot anticipate applicants' coated product recited in claim 26. Khanna does not provide any information to identify the "residual metal" film, if any, of Depauw.

Claim 37 stands alone

Claim 37 is dependant on claim 36 which is dependant on claim 21, and recites that the metal film is heated to at least 400^{O}C to change the amorphous metal film to a metal oxide.

The Office Action alleges that Depauw discloses in column 5, lines 21 – 35 that the metal film ("residual metal" film) may be thermally oxidized.

The discussion in the FIRST and SECOND OVERVIEW and the discussion patentably distinguishing claim 21 over Khanna in view of Depauw are hereby incorporated by reference.

Applicants respectfully submit that the discussion of Depauw in column 5, lines 21 – 35 does not disclose that the "residual metal" film may be thermally oxidized. Depauw discloses that

> In the case of the sacrificial metal, which serves the purpose of protecting the silver layer against oxidation, this is converted to oxide during any subsequent exposure to an oxidizing atmosphere. This is usually mostly effected during subsequent deposition of metal oxide, but also occurs during any subsequent heat treatment or during prolonged storage. If the silver is not so protected, the coated substrate of glazing material loses its low emissivity and its light transmission is dramatically reduced. The preferred sacrificial metal is titanium, which has the advantages of being easily oxidised and of forming an oxide of very low absorbency. We have discovered that the use of titanium as sacrificial metal gives a very effective barrier against oxidation of the silver.

Assuming for the sake of discussion only, the above discussion in Depauw is relevant to claim 37. The above discussion discloses a metal oxide that does not have the properties of the oxidized amorphous metal film recited in applicants' claim 37. More particularly, the oxidized amorphous metal film has a different density than the oxidized metal film (see discussion on page 6, lines 1 – 12 of the specification). Another difference between the discussion of Depauw and applicants' claim 37 is the fact that claims 37 recites a temperature whereas the above discussion of Depauw does not recite a temperature.

Khanna does not cure the above defects of Depauw

Claim 38, 41 and 42 stand and fall together.

Claim 38 is dependant on claim 36 which is dependant on claim 21. Claim 41 is dependant on claim 38, and claim 42 is dependant on claim 41. Claim 38 recites, among other things, a product having the metal oxide film deposited on the metal film prior to thermal oxidation of the metal film.

The Office Action does not specifically identify passages of Khanna and Depauw that make claim 38 unpatentable. Regarding claims 41 and 42 the Office Action alleges that Depauw discloses that the metal of the metal or metal oxide films may be titanium (column 8, lines 29 – 57 of Depauw) and that Khanna discloses that the metal may be titanium (column 1, lines 53 – 63 of Khanna).

The discussion in the FIRST and SECOND OVERVIEW and the discussion patentably distinguishing claims 21 and 36 over Khanna in view of Depauw are hereby incorporated by reference.

The coated product of claim 38 is a metal oxide film over the amorphous metal film. As was discussed above regarding claim 21, there is no discussion in Khanna in view of Depauw of a metal film over an amorphous metal film. For the sake of discussion and not admitting that Khanna and Depauw would be combined, the combination would be an amorphous ally film as the outer layer of Depauw. This combination would not render claim 38 unpatentable over Khanna in view of Depauw.

Claims 39 and 46 stand and fall together.

Claim 39 is dependent on claim 38, which is dependent on claim 36, which is dependant on claim 21, and claim 46 is dependant on claim 21 and each recite, among other things, that the metal oxide film has a thickness ranging from 40A to 120 A.

The Office Action alleges that Depauw in column 8, lines 29 – 57 discloses that the metal sub-oxide or metallic films may be deposited in the range of 25 to 450 A.

The discussion in the FIRST and SECOND OVERVIEW and the discussion patentably distinguishing claims 21and 38 over Depauw are hereby incorporated by reference.

The only film of the coated product of Depauw discussed in column 8, lines 29 – 57 is the 100 A titanium dioxide film. Depauw does not disclose that any of the underlying films of the coating article in column 8 are "residual metal" films. The discussion in the paragraph bridging columns 4 and 5 that the films may be sub-oxide or "residual metal' film does not mean that any of the film of the coated article of column 8 are sub-oxide or "residual metal " films.

Since the 100 A titanium dioxide film is not taught as being over an amorphous metal film, the coated article in column 8 of Depauw cannot teach applicants' claims 39 and 46.

Further, if the film of Khanna was used as the outer film of Depauw or any film of Depauw, the thickness recited in Depauw would not remain the same because changing the metal of the metal oxide films changes the optical properties of the coated article and would not meet the parameters set for the coated article by Depauw (see column 8, lines 60 – 62 of Depauw).

Claim 40 stands alone.

Claim 40 is dependant on claim 38, which is dependant on 36, which is dependant on claim 21. Claim 40 recites a coated product having, among other things, that the metal in each film is titanium, the density of the metal oxide film deposited over the metal film is 4 grams per cubic centimeter and the refractive index of the metal oxide film is 2.5.

The Office Action alleges that Depauw discloses that the metal of the metal or metal oxide films may be titanium (column 8, lines 29 – 57 of Depauw) and that Khanna discloses that the metal may be titanium (column 1, lines 53 – 63 of Khanna).

The discussion in the FIRST and SECOND OVERVIEW and the discussion patentably distinguishing claims 21and 38 over Khanna in view of Depauw are hereby incorporated by reference.

There is no discussion in Khanna or Depauw of the density or refractive index of the amorphous metal film of Khanna or the metal oxide films of the coatings of Depauw. Applicants on page 6, lines 1 – 12 discusses that the density of crystalline thermally oxidized titanium oxide coating is 4.0 grams per cubic centimeter. Since the article of column 8 of Depauw and the film in column 1 of Khanna are not thermally oxidized they cannot render applicants' claim 40 obvious.

Claim 43 stands alone.

Independent claim 43 recites a coated article having, among other things, a glass substrate, a first titanium oxide film formed by thermally oxidizing an amorphous sputtered titanium metal film deposited from a titanium metal cathode target in an atmosphere comprising argon and oxygen below a reactive switch point of the titanium metal cathode target, and a second titanium oxide film deposited over the first titanium oxide film.

The Office Action alleges that Depauw in column 8, lines 29 – 57 discloses that the metal of the metal or metal oxide may titanium, the reactive gas may be oxygen (column 2, lines 56 – 63). The Office Action further alleges that Khanna discloses that the metal may be titanium (column 1, lines 53 – 63), that the reactive gas may be oxygen (column 3, lines 31 – 33), the gas may be argon (column 3, lines 31 – 33), and the substrate may be glass (column 1, lines 34 and 35).

The discussion in the FIRST and SECOND OVERVIEW is hereby incorporated by reference.

Applicants respectfully submit that Depauw does not anticipate applicants' claim 43. More particularly, Khanna does not disclose thermally oxidizing the corrosive coating, and Depauw do not disclose that the coated article in

column 8 of Depauw is thermally oxidized. Applicants on pages 6 and 7 discuss the different properties of sputtered coated thermally oxidized and not thermally oxidized. Since there is a difference in optical properties and density, the thermally treated coated article of claim 43 will be different from the properties of the coated article made using the amorphous film of Khanna as the outer film of Depauw or any film of Depauw.

Applicants respectfully submit, based on the forgoing, that Khanna in view of Depauw does not render applicants' claim 43 obvious.

Claim 44 stands alone.

Claim 44 is dependent on claim 21 and recites, among other things; that the metal oxide film is comprised of the same metal as the underlying amorphous metal layer.

The Office action alleges that Khanna discloses that the metal may be titanium (column 1, lines 53 – 63). Depauw disclose that the metal of the metal or metal oxide films may be titanium, (column 8, lines 29 – 57).

The discussion in the FIRST and SECOND OVERVIEW and the discussion patentably distinguishing claim 21 over Khanna in view of Depauw is hereby incorporated by reference.

Khanna does not disclose two metal layers of the same metal. Depauw does not discuss how to make a sub-oxide film or a "residual metal" film. For the sake of discussion only and not admitting that one would combine Khanna and Depauw skilled in the art, combining Khanna with Depauw would provide an amorphous outer film. The arrangement the underlying films would not be known because they metal selected for the oxides would have to maintain the optics of the coated article of Depauw (see column 8, lines 60 – 63 of Depauw.

Claim 45 stands alone.

Claim 45 is dependent on claim 21 and recites that the oxidized amorphous metal oxide film has increased stability over the amorphous metal film.

The discussion in the FIRST and SECOND OVERVIEW and the discussion patentably distinguishing claim 21 over Khanna in view of Depauw is hereby incorporated by reference.

The Office Action does not reference any discussion in Khanna and Depauw relating to a coated product that has a reactively sputtered amorphous metal oxide film over the amorphous metal film. Since there is no referenced discussion in Khanna and Depauw, applicants respectfully submit that there is no combination of Khanna and Depauw that renders applicants' claim 46 obvious.

Claim 47, 49 and 50 stand and fall together.

Claim 47 is dependent on claim 21; claims 49 and 50 is dependant on claim 47. Claim 47 recites a coated product having, among other things anamorphous metal layer harder and less dense than a crystalline metal film sputtered in pure argon. The lower density enhances the rate of oxidation so that the amorphous metal film may be thoroughly oxidized at lower temperatures or in shorter times than required for oxidation of crystalline metal film.

The discussion in the FIRST and SECOND OVERVIEW and the discussion patentably distinguishing claim 21 over Khanna in view of Depauw is hereby incorporated by reference.

The Office Action does not reference any discussion in Khanna and Depauw relating to a coated product that has, among other things, an amorphous metal layer that is harder and less dense than a crystalline metal film of the type sputtered in pure argon. The lower density enhances the rate of oxidation so that the amorphous metal film may be thoroughly oxidized at lower temperatures or in shorter times than required for oxidation of crystalline metal film. Since there is no referenced discussion in Khanna and Depauw,

applicants respectfully submit that Khanna in view of Depauw do not render obvious the article of applicants' claim 47.

Claim 48 stands alone.

Independent claim 48 recites, among other things a coated product having, among other things, a substrate and a metal oxide film from oxidation of an essentially amorphous metal film sputtered from a metal cathode target in an atmosphere comprising inert gas and reactive gas, the metal in the metal cathode target having a reactive gas switch point, wherein the concentration of the reactive gas during sputtering is below the reactive gas switch point such that the metal target is sputtered in a metallic mode to deposit a metal film having an amorphous structure.

The Office Action alleges that Depauw in column 5, lines 21 – 35 discloses that the metal film may be thermally oxidized. No mention is made of Khanna.

The discussion in the FIRST and SECOND OVERVIEW and the discussion patentably distinguishing claim 21 over Khanna in view of Depauw are hereby incorporated by reference.

The metal oxide from the oxidized amorphous metal film is more chemically durable than an amorphous metal oxide film deposited by sputtering metal in an oxidizing atmosphere. The product of claim 48 is distinguishable from the product made according to the disclosure in column 5, lines 21 – 35 of Depauw. More particular the film of claim 48 would be more chemically durable because it is an oxidized amorphous metal film whereas the films of Depauw would be less chemically durable because it is a film that is partially or totally oxidized during the sputtering of the oxide films of the overcoat (see column 8, lines 50 – 64 of Depauw. There is no discussion in Khanna of oxidizing the amorphous metal alloy film.

Since the oxidized films of the coated product of claim 48 is different from the oxidized film in column 5, lines 21 – 35, the combination of Khanna and Depauw, if it can be made, does not render applicants' claim 48 obvious.

Claim 51 stands alone.

Independent claim 51 recites a coated product having, among other things, a substrate; and a metal oxide film comprised of crystalline metal oxide from oxidation of an essentially amorphous metal film sputtered from a metal cathode target in an atmosphere comprising inert gas and reactive gas, the metal in the metal cathode target having a reactive gas switch point, wherein the concentration of the reactive gas during sputtering is below the reactive gas switch point such that the metal target is sputtered in a metallic mode to deposit a metal film having an amorphous structure. A metal oxide film over the crystalline metal oxide film, where the metal oxide film is deposited by reactive sputtering of amorphous metal oxide over the amorphous metal film.

The Office Action alleges that Depauw discloses that the metal film may be thermally oxidized (column 8, lines 21 – 35). There is no mention of Khanna.

The discussion in the FIRST and SECOND OVERVIEW and the discussion patentably distinguishing claim 21 over Khanna in view of Depauw are hereby incorporated by reference.

There is no discussion in Khanna of the density of the amorphous metal alloy film of Khanna (column 1, lines 53 – 63). The density of the titanium film in column 5 of Depauw is higher than the density of the crystalline metal oxide film of claim 51. Although there is no metal film identified in claim 51, a comparison of claim 51 to the oxidized film of column 5 of Depauw should be equated, i.e. compare titanium metal oxide films. From the discussion on page 6, lines 1 – 12 of the specification, the titanium crystalline metal oxide film has a lower density than the titanium oxide film of column 5.

Because the films of claim 51 and of Khanna and Depauw are different, any combination of Khanna and Depauw does not render obvious the subject matter of claim 51.

Claim 52 stands alone.

Claim 52 is dependent on claim 51 and recites, among other things, a coated product where the crystallized metal oxide film is titanium oxide film with a crystalline structure having a density greater than 3.4 g/cm^3.

The discussion in the FIRST and SECOND OVERVIEW and the discussion patentably distinguishing claims 21 and 51 over Depauw are hereby incorporated by reference

The Office Action has not identified any section in Khanna and Depauw that can be combined to render claim 52 obvious. As discussed above regarding claim 51, there is coated article disclosed in Depauw of a crystalline metal oxide as defined in claim 52 having a density a density greater than 3.4 g/cm^3. The density of the alloy film of Khanna is not provided. Based on the forgoing, the combination of Khanna and Depauw would not render obvious the subject matter of claim 52

SUMMARY

Issue (a) Whether claims 38 – 42 are unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Applicants propose to amend the claim 38 to overcome the rejection of claims 38 – 42 under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Issue (b) Whether claim 40 is unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Applicants propose to amend claim 40 to overcome the rejection under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Issue (c) Whether claims 50 and 52 are unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Applicants propose to amend claims 50 and 52 to overcome the rejection under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Issue (d) Whether claim 51 is unpatentable under 35 U.S.C. 112, first paragraph, as being based on a nonenabling disclosure.

Applicants have identified support in the specification for claim 51. Applicants respectfully request the Board to find that the specification discloses the subject matter of claim 51 and reverse the rejection of the Office Action.

Issue (e) Whether claims 21 – 52 are unpatentable under 35 U.S.C. 102(b) over Depauw et al U.S. Patent No. 5,110,662 (also referred to as "Depauw").

The Office Action alleges that the paragraph bridging columns 4 and 5 discloses the amorphous metal oxide film recited in applicants' claims. Applicants submit that this disclosure in Depauw is not a teaching of applicants' amorphous metal film. The statement is a discussion of a coating defect that is subsequently corrected by, among other things, subsequent depositions in a reactive atmosphere. There is no discussion in Depauw of how the "residual metal" film is obtained. Without providing parameters of the coating process to obtain the "residual metal" film a comparison of Depauw and applicants' coated product cannot be made. Applicants' specification on the other hand discloses that the amorphous metal film of applicants' invention requires the appropriate amount of oxygen in the inert gas for purposes of the present invention is related to the cathode operating parameters, particularly the power, and the size of the target (page 3, lines 15 – 18) all of which are disclosed in applicants' specification.

Applicants' respectfully request the Board to find that Depauw does not anticipate applicant's claims 21 – 52 and respectfully requests the Board to reverse the rejection of the Office Action.

Issue (f) Whether clams 21 – 52 are unpatentable under 35 U.S.C. 103(a) over U.S. Patent No. 5,110,662 to Khanna et al (also referred to as "Khanna") in view of Depauw.

Applicants have discussed that one skilled in the art of corrosive coating would not combine Khanna with Depauw and that on skilled in the art of transparent low emissivity coating would not combine Depauw with Khanna. Further applicants have shown that there is no motivation to replace the films of Depauw with the films of Khanna.

For the sake of discussion only and not admitting that the combination would be made, applicants discussed the resultant coated article made using the combination of Khanna and Depauw and showed that the resultant coated action does not render obvious applicants claims 21 – 52.

Applicants' respectfully request the Board to find that Khanna in view of Depauw does not render applicant's claims 21 – 52 unpatentable and respectfully requests the Board to reverses the rejection of the Office Action.

Respectfully submitted,

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July 14, 2003

X. APPENDIX

Claims Involved in the Appeal

21. A coated product comprising:

a substrate;

a film sputtered from a metal cathode target in an atmosphere comprising inert gas and reactive gas, the metal in the metal cathode target having a reactive gas switch point, wherein the concentration of the reactive gas during sputtering is below the reactive gas switch point such that the metal target is sputtered in a metallic mode to deposit a metal film having an amorphous structure defined as an amorphous metal film; and

a metal oxide film over the amorphous metal film.

22. The product in accordance with claim 21, wherein the metal of the metal cathode target is selected from titanium, zirconium, tantalum, hafnium, niobium, vanadium and mixtures thereof.

23. The product in accordance with claim 22, wherein the metal of the metal cathode target is selected from titanium and zirconium.

24. The product in accordance with claim 23, wherein the metal of the metal cathode target is titanium.

25. The product in accordance with claim 21, wherein the metal film has a thickness ranging from 100 Å to 1500Å.

26. The product in accordance with claim 25, wherein the metal film has a thickness ranging from 200 Å to 700Å.

27. The product in accordance with claim 21, wherein the reactive gas is selected from oxygen, nitrogen and mixtures thereof.

28. The product in accordance with claim 27, wherein the reactive gas is oxygen.

29. The product in accordance with claim 27, wherein the inert gas is argon.

30. The product in accordance with claim 21, wherein the inert gas is argon.

31. The product in accordance with claim 30, wherein the reactive gas is oxygen.

32. The product in accordance with claim 31, wherein the substrate is glass, the metal in the metal film is titanium.

33. The product in accordance with claim 31, wherein the atmosphere comprises argon and up to 30 percent oxygen.

34. The product in accordance with claim 33, wherein the atmosphere comprises 2 to 15 percent oxygen.

35. The product in accordance with claim 21, wherein the substrate is glass.

36. The product in accordance with claim 21, wherein the metal film is thermally oxidized.

37. The product in accordance with claim 36, wherein the metal film is heated to at least 400°C.

38. The product in accordance with claim 36, further comprising a metal oxide film deposited on the metal film prior to thermal oxidation of the metal film.

39. The product in accordance with claim 38, wherein the metal oxide film deposited over the metal film has a thickness ranging from 40Å to 120Å.

40. The product in accordance with claim 38, wherein the substrate is glass, the metal in each film is titanium, the density of the metal oxide film deposited over the metal film is 4 grams per cubic centimeter and the refractive index of the metal oxide film is 2.5.

41. The product in accordance with claim 38, wherein the metal in each film is independently selected from titanium, zirconium, tantalum, hafnium, niobium, vanadium and mixtures thereof.

42. The product in accordance with claim 41, wherein the metal in each film is independently selected from titanium and zirconium.

43. A coated article comprising a glass substrate, a first titanium oxide film formed by thermally oxidizing an amorphous sputtered titanium metal film deposited from a titanium metal cathode target in an atmosphere comprising argon and oxygen below a reactive switch point of the titanium metal cathode target, and a second titanium oxide film deposited over the first titanium oxide film.

44. Product in accordance with Claim 21, wherein the metal oxide film is comprised of the same metal as the underlying amorphous metal layer.

45. Product in accordance with Claim 21, wherein the metal oxide film is comprised of reactively sputtered amorphous metal oxide to increase the thermal stability of the amorphous metal film.

46. Product in accordance with Claim 21, wherein the metal oxide film has a thickness of 40 to 120 Angstroms.

47. Product in accordance with Claim 21, wherein the amorphous metal layer is harder and less dense than a crystalline metal film sputtered in pure argon and the lower density enhances the rate of oxidation so that the amorphous metal film may be thoroughly oxidized at lower temperatures or in shorter times than required for oxidation of crystalline metal film.

48. A coated product comprising:

a substrate; and

a metal oxide film from oxidation of an essentially amorphous metal film sputtered from a metal cathode target in an atmosphere comprising inert gas and reactive gas, the metal in the metal cathode target having a reactive gas switch point, wherein the concentration of the reactive gas during sputtering is below the reactive gas switch point such that the metal target is sputtered in a metallic mode to deposit a metal film having an amorphous structure.

49. Product in accordance with Claim 47, wherein oxidation is by thermal oxidation.

50. Product in accordance with Claim 47, wherein the metal oxide is comprised of crystalline metal oxide.

51. A coated product comprising:

a substrate; and

a metal oxide film comprised of crystalline metal oxide from oxidation of an essentially amorphous metal film sputtered from a metal cathode target in an atmosphere comprising inert gas and reactive gas, the metal in the metal cathode target having a reactive gas switch point, wherein the concentration of the reactive gas during sputtering is below the reactive gas switch point such that the metal target is sputtered in a metallic mode to deposit a metal film having an amorphous structure; and

a metal oxide film over the crystalline metal oxide film, where the metal oxide film is deposited by reactive sputtering of amorphous metal oxide over the amorphous metal film.

52. The coated product of Claim 50, wherein the crystallized metal oxide film is titanium oxide film with a crystalline structure having a density greater than 3.4 g/cm^3.

1775/B

TRANSMITTAL OF APPEAL BRIEF (Large Entity)

Docket No.
1074D2

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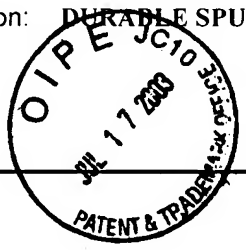
JUL 22 2003
GROUP 1700

In Re Application Of: **FINLEY, JAMES J., ARBAB, MEHRAN**

Serial No.	Filing Date	Examiner	Group Art Unit
10/075,021	02/12/2002	A. T. Piziali	1775

Invention: **DURABLE SPUTTERED METAL OXIDE COATING**



TO THE COMMISSIONER FOR PATENTS:

Transmitted herewith in triplicate is the Appeal Brief in this application, with respect to the Notice of Appeal filed on **May 9, 2003**

The fee for filing this Appeal Brief is: **$320.00**

☐ A check in the amount of the fee is enclosed.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **16-2025**

Signature

Dated: **July 14, 2003**

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I certify that this document and fee is being deposited on 07/14/03 with the U.S. Postal Service as first class mail under 37 C.F.R. 1.8 and is addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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